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# Prenatal Care via Telehealth



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## KEYWORDS

• Telehealth • Prenatal care • Remote patient monitoring • Obstetrics • COVID-19

## KEY POINTS

- Prenatal care can be provided through many modalities, including virtual care.
- Remote monitoring is a tool to use with virtual prenatal care visits and results in similar patient satisfaction as in-person care.
- When prenatal complications arise, the care team can transition back to in-person care. Better data and guidelines will be needed to improve the virtual management of pregnancy complications.
- Virtual care is growing as technology evolves for this population.

## INTRODUCTION/BACKGROUND

The primary goal of prenatal care is the birth of a healthy infant while minimizing maternal morbidity and mortality. The current model of prenatal care for a low-risk pregnancy in the United States includes a recommended 12 to 14 in-person visits throughout a 40-week pregnancy, typically with visits every 4 weeks until 28 weeks, every 2 weeks until 36 weeks, and weekly thereafter.<sup>1</sup> Despite significant medical and technological advances, this schedule has remained largely unchanged since its inception in the early twentieth century, when it was developed primarily for the early detection of preeclampsia.<sup>2</sup> This coincided with physicians taking primary responsibility for prenatal care and the transition of more births to a hospital setting; before this development, prenatal care was provided primarily by nurses and community midwives, with births taking place primarily in the home.<sup>2</sup>

There are growing data to support fewer prenatal visits for low-risk pregnancies. A 2015 study examined two groups of patients: those with fewer than 10 prenatal visits and those with 10 or more prenatal visits. There was no difference in neonatal outcomes between the two groups, but patients with more visits were more likely to undergo induction of labor and had a higher rate of cesarean delivery.<sup>3</sup> Further, guidelines for prenatal care delivery vary significantly around the world. In a comparison of the United States to peer countries, there was little variation in prenatal care

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guidelines for educational topics and psychosocial services, but significant variation in visit frequency. Of eight peer countries, all but one recommended fewer visits throughout pregnancy. More than half recommended a total of 7 to 10 visits, and most recommended a longer interval between visits in the third trimester.<sup>4</sup>

There are ongoing efforts to optimize and enhance prenatal care, including the incorporation of telehealth modalities. Telehealth has been investigated both as an adjunct to routine care and the basis of a full redesign of the prenatal care paradigm. Telehealth has been well established in obstetric care to improve access to specialty care and ultrasound interpretation for patients in rural settings.<sup>5</sup> In some rural areas deemed maternity-care deserts due to lack of access to care, telemedicine has been used to supplement routine prenatal care and postpartum care.<sup>5</sup> Telemedicine has also been used to support rural providers. The University of Arkansas for Medical Sciences has implemented state-wide educational campaigns around hypertension and hemorrhage management for rural hospitals, as well as 24-h access to educational materials, a high-risk pregnancy call center, and maternal-fetal medicine consultation.<sup>5</sup> Text-message-based educational interventions have improved smoking cessation in pregnancy and breastfeeding rates at 6 months postpartum.<sup>6</sup> A telephone-based lifestyle intervention decreased weekly gestational weight gain in patients at risk for excessive gestational weight gain.<sup>7</sup> Smartphone applications for mood tracking have demonstrated improved identification and service delivery for patients with perinatal symptoms of depression.<sup>8</sup>

Other groups have studied reduced in-person care models supplemented with telehealth. In 2019, the Mayo Clinic published their work on the OB Nest model, which consists of eight in-person physician appointments, six virtual visits with a nurse, and access to an online community of other pregnant people. Patients were supplied with a home blood pressure (BP) cuff and fetal Doppler.<sup>9</sup> Compared with usual care, OB Nest patients had higher satisfaction, decreased pregnancy-related stress, and increased duration of breastfeeding, with no differences in perceived quality of care, adherence to the American College of Obstetricians and Gynecologists (ACOG) guidelines, and clinical maternal and fetal outcomes.<sup>9</sup> The study authors postulated that the increased satisfaction and decreased pregnancy-related stress could be due to receiving care from the comfort of home, access to an online community for support throughout pregnancy, and access to home monitoring devices for fetal heart rate and BP.<sup>9</sup> Another study assessed patient satisfaction with a hybrid model, in which prenatal patients during the COVID-19 pandemic had the option to receive routine care with 12 to 14 in-person visits, or with one-third of the visits as virtual visits. Both groups were highly satisfied with their care, but those who had opted for virtual care had significantly higher mean satisfaction scores.<sup>10</sup> This was thought to be due to a shared desire to limit in-person care during the pandemic.<sup>10</sup> An additional study assessed patient comfort with the use of technology and telemedicine for weekly blood glucose review, as opposed to in-person visits, in pregnancies complicated by gestational diabetes. Patients generally were satisfied with this care, believed it to be safe, and appreciated the convenience, but noted some discomfort with the use of the technology such as a home BP cuff and fetal Doppler.<sup>11</sup>

## **GUIDELINE SUMMARY**

*The American College of Obstetricians and Gynecologists*<sup>1</sup>: ACOG recommends that obstetric visits be individualized (**Table 1**). They do recommend that women with known medical problems, complications with prior pregnancies, or those who had fertility treatment should be seen as early as possible. They acknowledge that

**Table 1**  
**Summary of national and international prenatal care guidelines**

Organization	Initial Prenatal	Frequency of Visits	Total Visits
ACOG	Within the first trimester, and dating ultrasound ideally before 13 6/7 wk	Every 4 wk until 28 wk, every 2 wk until 36 wk, then weekly until delivery, but can be individualized	Individualized based on each patients' needs
AAFP	First trimester	No guideline	7–12 for developed countries
NICE	First trimester	See <a href="#">Table 2</a>	10 for nulliparous patients and 7 for parous patients
WHO	Up to 12 wk	See <a href="#">Box 1</a>	8 “contacts”

although a typical pregnant patient is seen every 4 weeks until 28 weeks, every 2 weeks until 36 weeks, then weekly after that, there are women that may need more or fewer visits depending on their circumstances.

*The American Academy of Family Physicians (AAFP)*<sup>12</sup>: The AAFP has no guidelines for the frequency of prenatal visits, but acknowledges that 7 to 12 visits are typical in developed countries.

*The National Institute for Health and Care Excellence (NICE)*<sup>13</sup>: NICE recommends 10 routine antenatal appointments with an OB provider for nulliparous women and 7 routine antenatal appointments with an OB provider for parous women. See the schedule timing in [Table 2](#).

*World Health Organization (WHO)*<sup>14</sup>: The 2016 WHO Antenatal Care Model recommends a minimum of 8 antenatal care “contacts” during the pregnancy to reduce perinatal mortality and improve women’s experience of care. See the schedule in [Table 2](#). They prefer the word “contact” to “visit,” as it implies an active connection between a pregnant woman and a health care provider that is not implicit with the word “visit.” The term “contact” can be adapted to local contexts.

### **Evolution of Telehealth in Prenatal Care**

The novel coronavirus disease 2019 (COVID-19) was first identified in Wuhan, China, in December 2019. By January 30, 2020, the WHO declared COVID-19 a public health emergency, and it was officially classified as a pandemic by the WHO on March 11, 2020.<sup>15</sup> This led to rapid changes in health care delivery throughout the world to limit viral exposure to patients and health care staff, as well as conservation of personal protective equipment. For some fields, this included canceling and postponing nonurgent care and procedures; for prenatal care, this led to creative reimaginations of care delivery and, in many cases, the incorporation of telehealth.

For the average low-risk pregnant patient, the goal at many institutions was to plan in-person visits around necessary in-person care and supplement with virtual visits.<sup>16–19</sup> This typically included in-person visits for:

- The initial maternity care intake for a dating ultrasound and prenatal laboratories
- 20 weeks for the anatomy ultrasound
- 28 weeks for glucose tolerance testing, repeat complete blood count (CBC), administration of the tetanus, diphtheria, and pertussis (Tdap) vaccine, and Rhogam administration if indicated

Box 1
2016 World Health Organization antenatal care model schedule
Contact 1: up to 12 wk Contact 2: 20 wk Contact 3: 26 wk Contact 4: 30 wk Contact 5: 34 wk Contact 6: 36 wk Contact 7: 38 wk Contact 8: 40 wk
<i>Adapted from</i> World Health Organization. WHO recommendations on antenatal care for a positive pregnancy experience Updated 28 November 2016. Accessed December 1, 2021. <a href="https://www.who.int/publications/i/item/9789241549912">https://www.who.int/publications/i/item/9789241549912</a> .

- 36 weeks for a collection of the Group B streptococcal swab and determination of fetal presentation
- 39 weeks through delivery

Further modifications were required for high-risk pregnancies (eg, gestational diabetes, gestational hypertension, preeclampsia, and abnormal anatomy ultrasound) requiring closer monitoring, including pregnancies requiring more frequent ultrasounds, diagnostic procedures, and antenatal testing, which have limited options for conversion to telehealth.

**Models of telehealth in prenatal care**

*Columbia University Irving Medical Center (CUIMC) in New York City* examined the uptake of telehealth during the 5-week period from March 9 to April 12, 2020. Approximately, one-third of the 4248 total visits in the study period took place via telehealth, with an increase in the proportion each week to a peak of 50% to 60% of visits (via telehealth) by week 5, depending on the practice setting.<sup>20</sup> The CUIMC still attempted to

Table 2 National Institute for Health and Care Excellence Antenatal Care schedule	
Appointments for All Pregnant Women	Additional Appointments for Nulliparous Women
Visit 1: First trimester	25, 31, and 40 wk
Ultrasound at 11 + 2–14 + 1 wk	
Visit 2: 16 wk (14–18 wk)	
Ultrasound at 18 + 0–20 + 6 wk	
Visit 3: 28 wk	
Visit 4: 34 wk	
Visit 5: 36 wk	
Visit 6: 38 wk	
Visit 7: 41 wk (for those that have not given birth)	

*Data from* National Institute for Health and Care Excellence. Antenatal care. Updated 19 August 2021. Accessed December 1, 2021. <https://www.nice.org.uk/guidance/ng201/chapter/Recommendations>.

limit exposure by clustering the scheduling of required in-person services to the same day.<sup>21</sup> They began recommending cell-free fetal DNA for aneuploidy screening to avoid multiple visits for blood draws and ultrasound for nuchal translucency.<sup>21</sup> They also published guidelines for modifications of virtual care models for high-risk pregnancies.<sup>22</sup> These guidelines included modified in-person visit schedules, recommendations for home equipment such as home BP monitoring, and modified antenatal testing schedules, depending on the high-risk feature. As an example, for hypertensive disorders of pregnancy, they recommend access to a home BP cuff for all patients and recommend in-person visits after 36 weeks gestation. Similar modifications are detailed for conditions including maternal cardiovascular disease, maternal neurologic conditions, gestational and non-gestational diabetes mellitus, history of preterm birth and stillbirth, fetal conditions such as intrauterine growth restriction (IUGR), multiple gestation, and congenital anomalies.<sup>22</sup> Providers surveyed during a 5 week period from March to April 2020 felt that telehealth increased access (97%), provided adequate care (92%, definition of “adequate care” not published), and that they would continue to use the technology after the pandemic (89%). Providers were divided on whether they felt there was any change in preparation time before the appointment (50%), documentation time (56%), and patient rapport (53%).<sup>20</sup>

The University of Michigan developed the “4-1-4 prenatal plan” which included four in-person visits (at 8 weeks, 28 weeks, 36 weeks, and 39 weeks), one antenatal ultrasound at 20 weeks, and four virtual visits (at <8 weeks for counseling, 16 weeks, 24 weeks, and 32 weeks).<sup>17</sup> They encouraged home monitoring of BP and fetal heart rate.<sup>17</sup> Patients were surveyed and a majority felt that the conversion to telehealth improved access to care (68.8%), believed the care to be safe (53.3%), and reported satisfaction with care (77.5%).<sup>23</sup> However, only 45.5% of patients felt that the quality of virtual care was the same as the quality of in-person care, and only 40.3% of patients reported willingness to continue with virtual visits after the pandemic.<sup>23</sup> Patients identified decreased provider continuity and relationship building as a driver behind these findings.<sup>23</sup> Providers felt that telehealth improved access (96.1%), believed the care to be safe (62.1%), and reported satisfaction (83.1%). In contrast to patients, 92.2% of providers reported a willingness to continue this care model after the pandemic.<sup>23</sup> Barriers that providers identified to successful prenatal telehealth care were difficulty with interpreter services, difficulties for patients accessing and using the technology, the additional training required for staff and physicians, as well as a concern that differential access to technology and the Internet may lead to inequitable access to care.<sup>20,23</sup>

Multiple studies demonstrated that the no-show rate did not increase after the transition to telehealth.<sup>20,23</sup> The Perinatal Experiences and COVID-19 Effects (PEACE) study also found that most of the women reported being very, extremely, or moderately satisfied (71.4%) with their virtual experiences, although 89.9% preferred in-person care in non-pandemic conditions. Satisfaction scores decreased with increased pandemic duration.<sup>24</sup> Given this discrepancy between patient and provider satisfaction, more research is needed to determine the drivers of these lower satisfaction scores. It will be important to continue to monitor patient satisfaction and experience to inform the future evolution of telehealth prenatal care.

Of note, utilization of telehealth for prenatal care and satisfaction of care via telehealth was not consistent across all patients. One study at NYU Langone Medical Center in New York City examined differential uptake of telehealth across demographics and found that patients with public insurance were less likely to have at least one telehealth visit when compared with patients with private insurance (60.9% vs 87.3%,  $P < .0001$ ).<sup>25</sup> In addition, an inner-city safety-net hospital in New York City

assessed patient satisfaction scores in patients who had at least one virtual visit and one in-person visit from March 2020 to May 2020. Although all scores were in the “satisfied” range, the satisfaction scores were lower in all categories for virtual visits.<sup>26</sup> Although telehealth has the potential to improve access to care in some settings, these data raise the concern that a transition to telehealth has the potential to deepen pre-existing disparities in prenatal and maternity care. More data are needed on the implementation of telehealth prenatal care in public insurance and safety-net populations to ensure appropriate care delivery.

EXAMPLE PRACTICES

**Example Practice 1: UCHealth (University of Colorado) Family Medicine Residency Program, Denver, Colorado**

**AF Williams Family Medicine Center: mixed in-person and virtual visits**

AF Williams Family Medicine Center introduced a schedule displayed in [Table 3](#), composed of decreased in-person visits with a combination of virtual visits. For those patients with high-risk pregnancies, patients were only offered virtual visits with the approval of the provider. Each patient was given a home BP cuff for monitoring. In addition, patients were offered monthly group informative sessions via Zoom (Zoom Video Communications, Inc, San Jose, CA) based on trimester. These sessions were helpful to patients but not well attended (around 25%–50% attendance) and eventually ceased after 4 months. Over time, pregnant patients preferred to be seen in-person over virtual visits, and the clinic eventually stopped scheduling regular virtual visits once in-person visits increased. AF Williams still has virtual visits available

Table 3 AF Williams Family Medicine Center schedule		
Maternity Care Visits	Telehealth	In-Person
New maternity care intake with nurse	X	
New maternity care intake with provider		X
16 wk		X
20 wk		Ultrasound visit
24 wk	X (at patient discretion)	
28 wk		X
32 wk		X
34 wk (with BP cuff)	X (at patient discretion)	
36 wk		X
37 wk (with BP cuff)	X at patient discretion))	
38 wk (with BP cuff)	X (at patient discretion)	
39 wk		X
40 wk		X
41 wk		X
Postpartum visit with baby (if the baby is AFW patient)		
2–3 d		X
2 wk		X
2 mo		X
Postpartum visit with no baby at AF Williams Family Medicine Center (AFW)		
2 wk and 6 wk	X	

to pregnant patients if they have issues with scheduling or coming to the clinic, but these visits have become rare.

**Example Practice 2: UCHealth Family Medicine Practice Located in the Denver, Colorado Metropolitan Area**

***Westminster Family Medicine: virtual group prenatal care***

To decrease the loneliness and isolation many pregnant women were experiencing during the pandemic for fear of contracting COVID while pregnant, UCHealth Westminster Family Medicine began virtual group prenatal visits (Table 4). The format consisted of six sessions, meeting once per month, which repeated continuously starting in January 2021. Patients started at any point in the curriculum, creating a group spanning all gestational ages. The project received funding from a Colorado Medicaid Upper Payment Limit Grant and purchased home Doppler monitors and BP cuffs for patients to use. Once monthly, a 2-hour block was used on the provider's schedule to see each of up to six patients in 10-min individual appointments, with a 1-hour talk from an external speaker and questions answered as a group. For most of the first year, the patients and speakers all met via Zoom. During the brief individual check-in, the provider was able to have the patient use the Doppler to auscultate fetal heart tones and check BP. Any upcoming laboratories were coordinated with the supporting medical assistant/project manager before or after the provider saw the patient. Patients were generally seen in person at least once per month, so patients occasionally end up having slightly more appointments in the first half of pregnancy. Ten prenatal patients participated in the program between January 2021 and October 2021. One notable complication arose where, due to inability to measure fundal heights, a patient had a presumed delay in diagnosis of sizes less than dates and subsequent concern for IUGR. Despite this concern, the baby was appropriate for gestational age at birth. Of note, the evidence to support the routine use of fundal height measurements as a screening tool to identify IUGR is inconclusive, although commonly still practiced as the standard of care.<sup>27</sup>

After the COVID-19 vaccine became available to patients, they were given the option to attend class in person, which after September 2021 all patients chose to do. The class is ongoing and maintains social distancing and masking in a large conference room with speakers still on Zoom. The curriculum topics (and presenter types) include peripartum mood changes (psychologist); normal vaginal delivery/non-pharmacologic pain management (doula); pharmacologic pain management (anesthesiologist); complications of pregnancy (maternal-fetal medicine provider [MFM]); C-sections, assisted delivery, the COVID vaccine in pregnancy (MFM); and breastfeeding (lactation consultant).

**Example Practice 3: Web Application**

Babyscripts<sup>28</sup> is an application that allows maternity providers to enroll their patients. The cost is several hundred dollars per patient. The patient receives a Bluetooth scale and BP monitor which synchronizes with the application. The patient checks in weekly with the application to review topics about her current stage of pregnancy, weigh herself, and check her BP. In addition, patients attend in-person appointments every 8 weeks until 32 weeks, then at 34, 36, 37, 38, and 39 weeks. In a study of 88 women, 47 were assigned to the "Babyscripts" group and 41 to the control group (standard care). Patients were allocated via quasi-randomization based on whether they had an iPhone. Although not powered to detect a difference in perinatal outcomes, the study showed a reduction in in-person visits in the Babyscripts group compared with the control group, and no statistically significant difference between patient or provider satisfaction.<sup>29</sup>



Table 4 Westminster Family Medicine: Proposed telehealth hybrid prenatal care schedule <sup>a</sup>														
	First Trimester	Second Trimester				Third Trimester								
Weeks' Gestation	8	12	16	20	24	28	30	32	34	36	37	38	39	40
Required testing?	Laboratories, Pap	U/S		U/S		Glucose tolerance test (GTT), TDaP				Group B Strep (GBS) and confirm vertex				
Telehealth possible?	N	Y	Y	Y	Y	N	Y <sup>a</sup>	Y <sup>a</sup>	Y <sup>a</sup>	N	Y <sup>a</sup>	Y <sup>a</sup>	Y <sup>a</sup>	Y <sup>a</sup>

<sup>a</sup> Table assuming appropriate capacity for remote monitoring with blood pressure cuff and home Doppler and following WHO guidelines to include a minimum of 8 touchpoints during pregnancy, supplement per provider, and patient comfort. For complications of pregnancy, individual assessments based on the severity of complications need to be considered.

## DISCUSSION

Using telehealth for prenatal care is still an evolving field, in which the COVID-19 pandemic has accelerated its use. There remain discussions on the appropriate number of prenatal visits for low-risk patients, with some evidence that not only does patient and provider satisfaction improve, fewer visits may also improve maternal outcomes such as fewer inductions of labor and cesarean sections without any differences in neonatal outcomes.

Virtual visits can be a valuable tool to improve access to prenatal care, especially in cases where clinics may limit in-person visits because of safety concerns or in more remote rural settings where access to maternity providers may be limited. Developing a hybrid model of care which includes a mix of in-person and virtual visits to include group visits can be an effective way to provide prenatal care and education. In low-risk pregnancies, as few as four in-person visits can be accomplished with the rest of the visits conducted virtually with remote BP and fetal heart tone monitoring. However, the most effective process to develop this workflow is still not clear. Prenatal patients have expressed satisfaction with virtual prenatal care, especially to limit in-person care to limit infection risk during the pandemic. However, when there were opportunities to be seen in person, especially as the COVID pandemic continued and in-person care returned, many patients choose to be seen in person.

Many questions remain with virtual prenatal care. There is no clear guidance on how to address pregnancy complications, which will usually result in converting virtual visits to in-person assessments. Concerns still exist on missing important complications that in-person visits may catch compared with virtual visits, such as growth restrictions, gestational hypertension, or preeclampsia. There is limited evidence on how to best use home monitoring such as blood pressure (BP) cuffs and fetal Doppler monitoring. Many barriers to this aspect of virtual care remain. Patients who received access to home fetal Dopplers may potentially have higher satisfaction with virtual care, but it is not known the true effect of home monitoring on satisfaction or outcomes. Lack of access to the technology to complete virtual visits, including home monitoring, may limit the effectiveness of virtual visits and widen health care disparities between patients. Other routine care such as assessing fetal growth with fundal heights is another challenge that may need more evidence to determine the appropriate frequency and accuracy of fundal heights, especially in later gestation.

Last, as we view virtual prenatal care as a way to improve access to care, caution is needed to assure virtual care does not cause a greater gap in health care disparities. Access to the technology required for successful virtual visits, such as appropriate Internet bandwidth, may be more available for some patients and less available to others. In addition, access to and comfort with the use of remote monitoring equipment is another factor that could add to health care disparities.

## CLINICS CARE POINTS

Telehealth for prenatal care has shown significant promise. We make the following recommendations:

- For patients with low-risk pregnancies, we recommend following the World Health Organization guidelines to include a minimum of 8 touchpoints during pregnancy, with additional touchpoints based on provider and patient comfort (see [Table 4](#)).
- After 24 to 28 weeks, home Doppler and home blood pressure cuffs can support a more robust virtual care model.

- Patients need more education regarding when an in-person visit might be more appropriate if they choose to do more visits virtually. This can be done via an registered nurse (RN) educator, medical assistant (MA) educator, or prenatal education class model.
- Consider the impact of your virtual care model on disparities. For large volume practices, we recommend a quality improvement infrastructure during implementation to ensure you are not exacerbating existing disparities.

## DISCLOSURE

None of the authors report any disclosures.

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